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(12) # EUROPEAN PATENT APPLICATION

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(54) **Winding thread.**

(57) Apparatus for winding a package from tension-sensitive thread such as slubbing comprises driven parallel roller support means for the package which rotate the package by peripheral contact therewith and to effect controlled tensioning of the thread where it encounters the package surface.

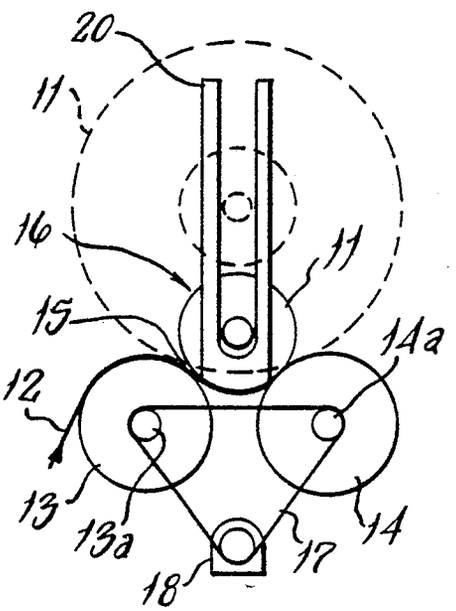

FIG.1

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WINDING THREAD

This invention relates to winding tension-sensitive thread such as slubbing.

Slubbing is, being twistless or essentially so, very fragile and easily broken under very light tensions. On that account it is difficult to wind into a package.

Conventional winding techniques employ a surface-driven winding package which runs up a ramp as it grows during the wind. The slubbing is fed to the nip of the package and the driving roller under substantially no tension. The contact pressure at the nip is increased above the weight of the package by the inclined ramp arrangement.

Such a technique is ordinarily capable of winding a soft, fractional kilogram package. Slubbing packages require delicate handling to avoid loops sloughing off or deformation such as would make unwinding more difficult. The relatively small size of the packages means correspondingly high handling costs and frequent package changing operations.

The present invention provides, however, a technique which can produce large, firm, well-wound slubbing packages.

The invention comprises a method for winding a package from tension-sensitive thread such as slubbing comprising supporting the package whilst being wound on a pair of parallel rollers which are both driven so as to rotate the package by peripheral contact therewith and to effect controlled tensioning of the thread where it encourters the package surface.

The rollers may be driven differentially to effect such tensioning. The thread may first encounter the slower moving roller. The roller may have surface speeds differing by up to 10%.

One of the rollers may have a gripping surface, such as a rubber surface, which may be dimpled.

It may be arranged also, however, that the package bears more heavily on one roller than the other and may in fact be held clear of one of the rollers which is however wrapped to a certain angle by the oncoming thread.

Ordinarily, the distribution of the thread axially of the package is effected by a simple traverse mechanism traversing either the package relative to the thread guiding arrangement or the latter relative to the former. A simple harmonic traverse motion is employed, this being adequate for the inherently low quality of winding characteristic of slubbing packages -the improvement to be derived from a constant speed traverse mechanism (such as is commonly used in winding twisted yarns and continuous filament yarns to give a well-shaped package with 'straight' cylindrical or conical sides) would scarcely be noticed in a soft slubbing package.

An additional measure to improve package formation is to control or prevent any tendency for the thread to roll on the roller surface or before the roller/package interface at the edges of the distributed wind. Such control can be effected by increasing the transverse frictional effect of the roller as compared to the circumferential frictional effect, as by profiling the roller surface with circumferential grooves. Another way such control can be applied is by having increased frictional coefficient surfaces on the roller at the location of the edges of the wind, as by having inset rubber rings.

Using techniques according to the invention, moreover, the use not only of a constant speed traverse mechanism and such edge control measures, but also of pattern breaker means therewith makes a significant difference to the quality of the resultant package.

The invention also comprises apparatus for winding a package from tension-sensitive thread such as slubbing comprising driven parallel roller support means for the package which rotate the package by peripheral contact therewith and to effect controlled tensioning of the thread where it encounters the package surface.

The rollers may be driven with fixed ratio differential surface speeds, which may be effected by having different diameter rollers rotated at the same rotational speed.

Or variable differential speed drive means may be provided.

Embodiments of apparatus and methods for winding tension-sensitive threads according to the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is an end elevation of one winding arrangement,

Figure 2 is a front elevation of the arrangement illustrated in Figure 1,

Figure 3 is an end elevation of another arrangement,

Figure 4 is a plan view of the arrangement illustrated in Figure 3 also showing a traverse mechanism.

Figure 5 is an end elevation of another arrangement,

and Figure 6 is an end elevation of yet another arrangement.

The Figures illustrate winding a package 11 from tension-sensitive thread 12 such as slubbing comprising supporting the package 11 whilst being wound on a pair of parallel rollers 13, 14 which are both driven so as to rotate the package by peripheral contact therewith and to effect controlled tensioning of the thread 12 where it encounters the package surface 16 at 15.

In Figures 1 and 2 the package 11 is shown in full line at the beginning of the wind, in broken line at full size at the end of the wind. The package 11 is guided and stabilized by vertical guide rails 20 for the package centre spindle.

In Figures 1 and 2 the rollers 13, 14 are driven differentially to effect such tensioning, having different surface speeds by virtue of the fact of one of them, 14, is of slightly larger diameter than the other, both being driven at the same rotational speed by timing belt means 15 running over sprockets 13a, 14a of the rollers 13, 14 and being driven by an electric motor 16.

Alternatively, the rollers 13, 14 could be the same size, the surface speed differential being derived from differently sized sprockets 13a, 14a.

It is arranged that the faster-moving roller 14 is encountered second by the thread 12. The effect of this is that the slower moving roller 13 imparts a slight drag or draft to the thread 12 which results in a controlled tension, which is to say a tension which is always within the limits of tension to which the thread can be subjected without, in the case of slubbing, for example, breaking or in the case of a very extensible yarn without unduly extending the same.

Even such low tension as slubbing can withstand is found to result in a firm slubbing package. Such firmness can allow the building of a package as proved already to be of at least 1.8 Kg and without any tendency to sloughing of turns, especially when built with a constant speed traverse motion. Axial and circumferential pattern breaking will clearly give superior builds.

Typical speed differentials can be up to 10% - 2% and 4% have been used with best effect.

Figures 3 and 4 show an arrangement basically similar to that of Figures 1 and 2 but with the rollers 13, 14 the same size, one, 13, or them, however, being covered with a rubber, especially a dimpled rubber (as for a table tennis bat) sleeve 31.

In Figures 3 and 4 is shown an edge control arrangement comprising increased frictional coefficient bands 33. eg. of rubber set in to the surface of the roller 13 at the edges of the distributed wind. These are for the purpose of controlling the tendency of the thread 12 to roll or slip axially of the roller 13 at the reversal points. The roller 13 could, instead, be profiled with closely spaced shallow circumferential grooves for the purpose of controlling such tendency.

The rollers are driven at the same speed or at different speeds as desired by a motor/differential gearbox arrangement 32 whereby the relative speeds of the rollers 13, 14 can be readily varied.

Figure 4 illustrates also a traversing arrangement comprising a hydraulic ram 41 programmed to give a constant speed stroke moving the winding assembly from side to side to distribute the slubbing axially of the package 11. To prevent build up of radius at the edges of the package, the stroke of the ram 41 is itself shifted slightly from side to side and its speed of traverse is varied slightly during the build for pattern breaking purposes. This is effected by a controller 42 for the ram 41 programmed in accordance with conventional package building techniques.

Of course, it is also possible to hold the package stationary in the axial sense and tranverse a thread guide relatively thereto.

Figures 5 and 6 illustrate different arrangements in which the controlled tensioning is effected by having a differential contact pressure of the package 11 on the two rollers 13 and 14. In the arrangement of Figure 5, the guide rails 20 are displaced slightly from the plane 51 which is equidistant from the axes of the rollers 13 and 14. Thus even though the rollers 13 and 14 are the same size and driven to rotate at the same speed, the package 11 will rest on the roller 14 with a greater pressure than it will on the roller 13 and, depending on the extent of the displacement of the guide rails 20 from the plane 51, may even be slightly clear of roller 13 by as much as the diameter of the thread 12. The differential pressure thus brought about is enough to effect a slight drag or draft on the thread as between the two rollers 13 and 14 to bring about the imrpoved wind. Of course, the two rollers 13 and 14, even with this differential pressure arrangement, may still be of different size and/or be driven at different surface speeds and/or have different frictional coefficient surfaces.

Figure 6 shows an arrangement in which the guides 20 are replaced by a pivoting cradle 61, which can be arranged by appropriate selection of the pivot axis and/or by a suitable linkage to cause the package 11 to lie with differential pressure on the rollers 13 and 14 or not at all on the roller 13, and which may also be used with different sizes, surface speeds and frictional coefficients of the roller surface.

The illustrated arrangements may be operated with different threading paths. For example, the slubbing may be fed in between the two rollers. Different threading methods, different speed dif-

ferentials, different roller surface configurations will be found to affect the quality of package built. However, using the techniques described and illustrated, firm, dense, well formed packages of slubbing can readily be wound to substantially greater package weights than are possible using conventional equipment.

The winding method and apparatus have been demonstrated with twistless wool slubbing. It is thought best results are obtained when the controlled tensioning is just sufficient to pull crimp out of the fibres but not noticeably to draft the slubbing i.e. to cause the fibres to slide over each other.

The technique will clearly work with other extensible threads such as crimped, e.g. false twist crimped or torque stretch yarn, and elastomeric yarn, in the sense that at least nothing untoward will happen and indeed the precise control of tensioning of the thread where it encounters the package surface will probably give better winding in many cases. Undoubtedly, however, it is of major and totally unexpected benefit to extend the idea to the winding of slubbing, where dramatic improvements in the quality and size of a slubbing package have been established.

Claims

1. A method for winding a package from tension-sensitive thread such as slubbing comprising supporting the package whilst being wound on a pair by parallel rollers which are both driven so as to rotate the package by peripheral contact therewith such as to effect controlled tensioning of the thread at its tangent to the package surface.

2. A method according to claim 1, in which the rollers are driven differently to effect such tensioning.

3. A method according to claim 2, in which the thread first encounters the slower-moving roller.

4. A method according to claim 2, in which the rollers have surface speeds differing by up to 10%.

5. A method according to claim 1, in which one at least of the rollers has a gripping surface.

6. A method according to claim 5, in which one roller has a rubber surface.

7. A method according to claim 6, in which the rubber surface is dimpled.

8. A method according to claim 1, in which a traverse mechanism equipped with pattern breaker means is used to control the axial distribution of the thread during winding.

9. Apparatus for winding a package from tension-sensitive thread such as slubbing comprising driven parallel roller support means for the package which rotate the package by peripheral contact therewith such as to effect controlled tensioning of the thread at its tangent to the package surface.

10. Apparatus according to claim 9, in which the rollers are driven with different surface speeds.

11. Apparatus according to claim 9, in which the rollers are arranged so that the thread first encounters the slower-moving roller.

12. Apparatus according to claim 9, comprising variable differential speed drive means for the rollers.

13. Apparatus according to claim 9, in which at least one of the rollers has a gripping surface.

14. Apparatus according to claim 13, in which said gripping surface is of rubber.

15. Apparatus according to claim 14, in which said rubber surface is dimpled.

16. Apparatus according to claim 9, comprising traverse means for distributing the thread axially of the package.

17. Apparatus according to claim 16, said traverse means comprising pattern breaker means.

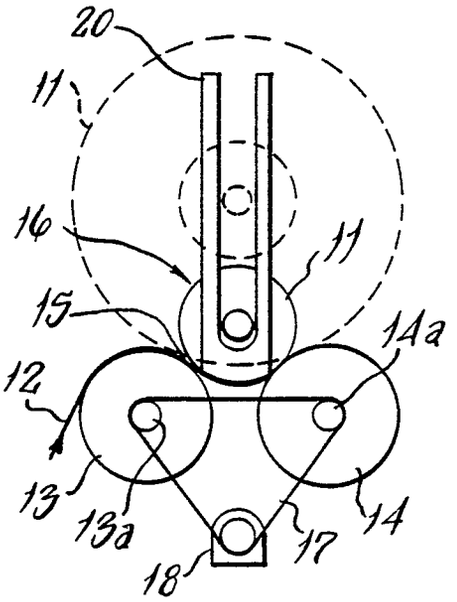


FIG.1

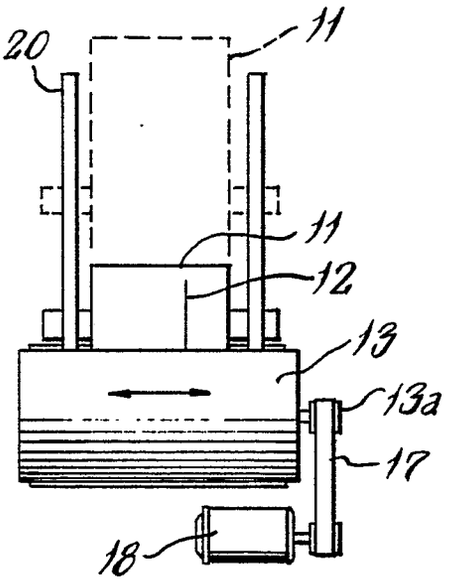


FIG.2

FIG.3

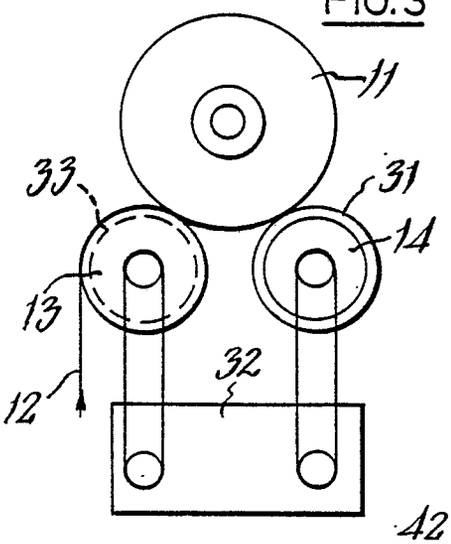
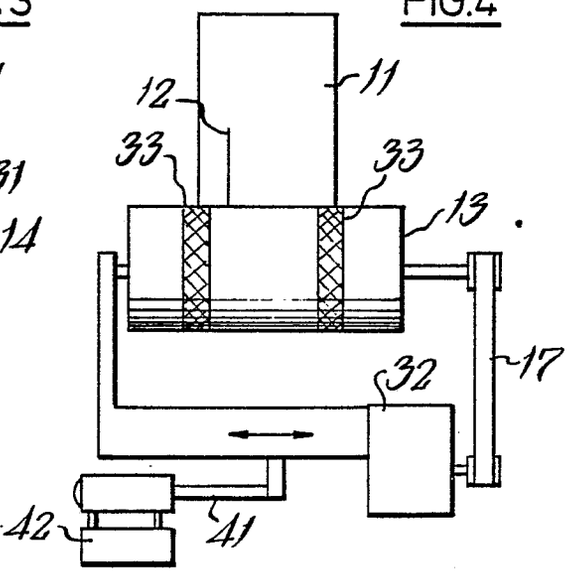


FIG.4



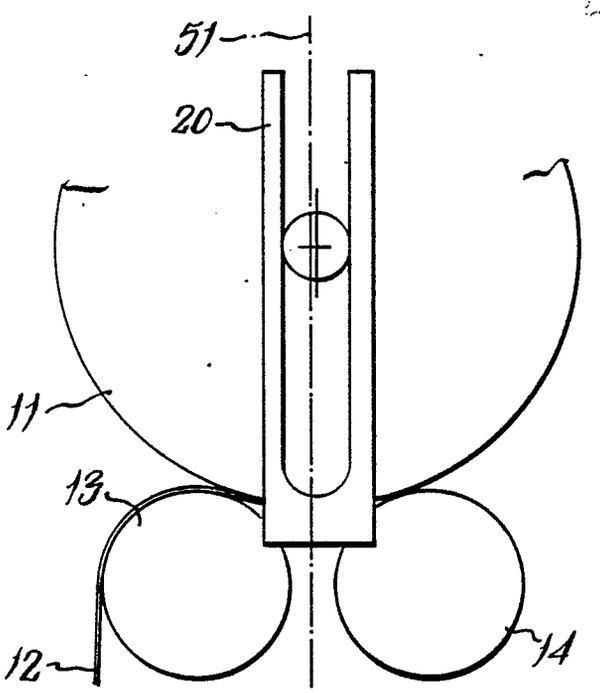


FIG.5

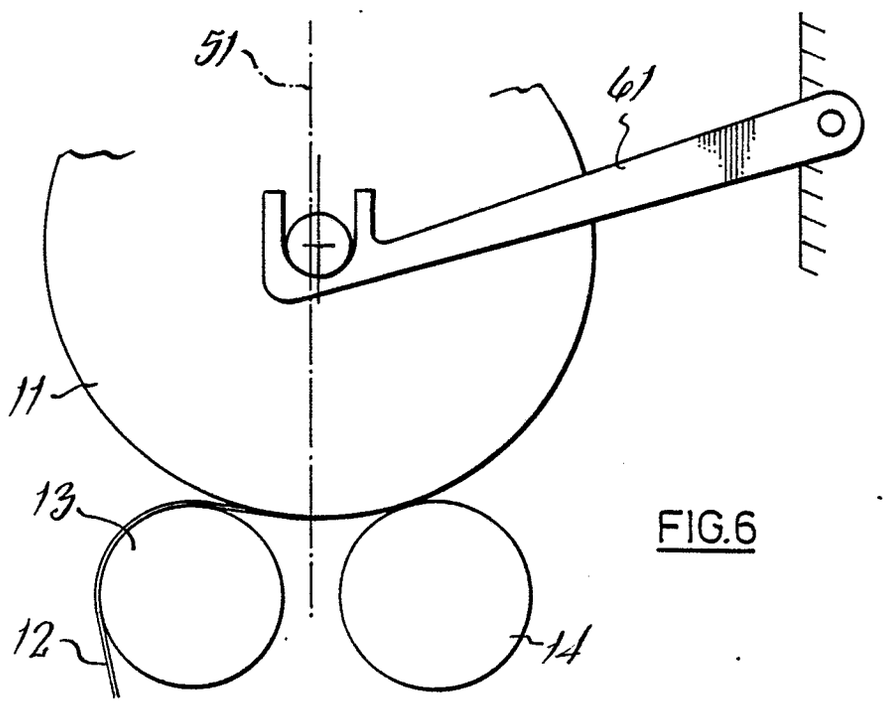


FIG.6

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EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 87301886.5

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE - A1 - 2 507 891 (EVOLUTION S. A.) * Claim 1 * --	1,9	B 65 H 54/42
A	CH - B - 502 944 (IND.-WERKE KARLSRUHE A.G.) * Totality * --	1,9,13	
A	DE - A1 - 3 513 796 (BARMAG BARMER MASCH. AG.) * Totality * --		
A	DE - A1 - 2 714 463 (PLATT SACO LOWELL LTD.) * Totality * ----		

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 65 H 54/00
B 65 H 59/00
B 65 H 77/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	11-06-1987	JASICEK

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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